UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/605,271	06/28/2000	Christopher Henry Rohrs	0918.2015-001(PD99-2858)	5332

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EXAMINER
ABEL JALIL, NEVEEN

ART UNIT	PAPER NUMBER
2175	

DATE MAILED: 03/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

-- *The MAILING DATE of this communication appears n th cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

DOV POPOVICI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2* .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Claim Objections

1.   Claim 16 is objected to because of the following informalities: In claim 16, line 1,

the recitation of "The collector as claimed in Claim 9" should be -- The collector as claimed in

Claim 10--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
> in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
> patent by another filed in the United States before the invention by the applicant for patent, except that an
> international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
> subsection of an application filed in the United States only if the international application designated the United
> States and was published under Article 21(2) of such treaty in the English language.

3.   Claims 1, 9, 17, 25 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by

Edit (U.S. Pub. No. 2002/0166116).

        As to claims 1, 9, and 17, Edit discloses a collector for collecting (See figure 7, 710,

garbage collection program) non-referenced objects stored in a heap (See abstract) by a program

executing in a computer system (See page 7, column 2, lines 31-35, wherein "program code"

reads on "sequence of instructions") comprising:

        an object allocation routine (See page 4, column 1, lines 25-41) which stores an object of

a particular type in one of a plurality of spaces in the heap (See page 3, column 1, lines 56-67)

dependent on a predefined category for the type (See page 3, column 1, lines 6-67, also see abstract, wherein "category" reads on "reference and non-reference type"); and

a collection routine (See page 4, column 1, lines 25-41) which searches one of the spaces for referenced objects and reclaims non-referenced objects stored in the searched space (See page 1, column 1, lines 41-63, wherein "space" reads on "memory").

As to claims 25, and 26, Edit discloses a computer system (See page 2, column 2, lines 19-22) comprising:

a central processing unit (See figure 6, 102, processor) connected to a memory bus (See figure 6, 104, main memory) by a system bus (See figure 6, 101, bus);

an I/O system, connected to the system bus by a bus interface (See page 2, column 1, lines 64-67); and

a collector for collecting (See figure 7, 710, garbage collection program) non-referenced objects (See page 5, column 1, lines 58-67) stored in a heap (See figure 7, 720, memory heap), by a program having computer readable program code thereon, executing in a computer system (See page 7, column 2, lines 31-35, wherein "program code" reads on "sequence of instructions"), the collector:

storing an object of a particular type in one of a plurality of spaces in the heap (See figure 7, 720, memory heap) dependent on a predefined category for the type (See page 3, column 1, lines 6-67, also see abstract, wherein "category" reads on "reference and non-reference type");

searching one of the spaces for referenced objects; and

reclaiming non-referenced objects stored in searched space (See page 1, column 1, lines

41-63, wherein "space" reads on "memory").

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

5.   Claims 2-3, 6-8, 10-11, 14-16, 18-19, and 22-24 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Edit (U.S. Pub. No. 2002/0166116) in view of Engelstad et al. (U.S

Patent No. 5,485,613).

As to claims 2, 10 and 18, Edit discloses further comprising: a sample and partition

routine which defines a category of an object stored (See abstract, also see page 2, column 1,

lines 8-15, wherein "category" reads on "partitions registers in to volatile and on-volatile

registers...into reference and non-reference registers") in the heap to be hot or cold.

Edit does not disclose in the heap to be hot or cold.

Engelstad et al. discloses in the heap to be hot or cold (See column 9, lines 5-19, wherein

"hot" reads on "permanent", and wherein "cold" reads on "temporary").

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to have modified Edit to include in the heap to be hot or cold.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified <u>Edit</u> by the teaching of <u>Engelstad et al.</u> to include in the heap to be hot or cold because dividing and indicating the heap by age mortality of the object reduces memory processing and freeing up memory storage space.

As to claims 3, 11 and 19, <u>Edit</u> as modified discloses wherein upon determining that hot space is full, the collection routine searches cold space and hot space (See <u>Engelstad et al.</u> column 23, lines 14-36, wherein "searches" reads on "scanned", column 9, lines 5-19, wherein "hot" reads on "permanent", and wherein "cold" reads on "temporary") for referenced objects and moves referenced objects (See <u>Engelstad et al.</u> column 24, lines 13-27) of the hot category stored in hot space to cold space (See <u>Engelstad et al.</u> column 9, lines 5-19, wherein "hot" reads on "permanent", and wherein "cold" reads on "temporary").

As to claims 6, 14 and 22, <u>Edit</u> as modified discloses wherein the sample and partition routine (See page 3, column 2, lines 33-40, wherein "routine" reads on "runtime") defines the object category (See abstract, wherein "category" reads on "reference and non-reference type") dependent on object type mortality (See <u>Engelstad et al.</u> column 3, lines 1-16, wherein "mortality" reads on "time of creation").

As to claims 7, 15 and 23, <u>Edit</u> as modified discloses wherein the sample and partition routine (See page 3, column 2, lines 33-40, wherein "routine" reads on "runtime") estimates the object mortality (See <u>Engelstad et al.</u> column 3, lines 1-16, wherein "mortality" reads on "time of

creation") dependent on difference (See figure 4, 420, list previous, and 430, list next, both show "difference" by comparing two different lists) of the number of bytes of the object type (See figure 4, 440, RefCount/Ref Bits) stored in the heap before a collection and the number of bytes of the object type stored in the heap after the collection (See figure 4, 420, list previous, and 430, list next, both show "before and after" by comparing two different lists).

As to claims 8, 16 and 24, <u>Edit</u> as modified discloses wherein the sample and partition routine (See page 3, column 2, lines 33-40, wherein "routine" reads on "runtime") partitions the heap to minimize between hot space and cold space (See column 9, lines 5-19, wherein "hot" reads on "permanent", and wherein "cold" reads on "temporary").

<u>Edit</u> as modified does not disclose intergenerational pointers.

<u>Engelstad et al.</u> discloses intergenerational pointers (See column 16, lines 35-55, wherein "intergenerational" reads on "previous ...next").

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified <u>Edit</u> as modified to include intergenerational pointers.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified <u>Edit</u> as modified by the teaching of <u>Engelstad et al.</u> to include intergenerational pointers because pointers allow for marking of a selected group of different age objects (different generation) to be able to be used together and reduce overhead associated with a generation scan.

6.   Claims 4-5, 12-13, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Edit (U.S. Pub. No. 2002/0166116) in view of Engelstad et al. (U.S Patent No. 5,485,613)

as applied to claims 1-3, 6-11, 14-19, and 22-26 above, and further in view of Endicott et al. (U.S.

Patent No. 6,047,295).

As to claims 4, 12 and 20, Edit as modified discloses wherein the sample and partition

(See page 3, column 2, lines 33-40, wherein "routine" reads on "runtime") further comprises:

between an object stored in hot space and an object stored in cold space (See Engelstad et

al. column 9, lines 5-19, wherein "hot" reads on "permanent", and wherein "cold" reads on

"temporary").

Edit as modified does not disclose a write barrier elimination routine, which eliminates a

write barrier.

Endicott et al. discloses a write barrier elimination routine, which eliminates a write

barrier (See Endicott et al. column 12, lines 1-14, also see column 10, lines 11-20, and column

10, lines 48-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to have further modified Edit as modified to include a write barrier

elimination routine, which eliminates a write barrier.

It would have been obvious to one of ordinary skill in the art at the time the invention

was made to have further modified Edit as modified by the teaching of Endicott et al. to include

a write barrier elimination routine, which eliminates a write barrier because providing a write

barrier ensure proper synchronization with the garbage collector and protect data from being lost

thereby reducing overhead.

Edit as modified still does not teach an intergenerational pointer.

Engelstad et al. discloses intergenerational pointers (See Engelstad et al. column 16, lines

35-55, wherein "intergenerational" reads on "previous ...next").

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to have further modified Edit as modified to include intergenerational

pointers.

It would have been obvious to one of ordinary skill in the art at the time the invention

was made to have further modified Edit as modified by the teaching of Engelstad et al. to include

intergenerational pointers because intergenerational pointers because pointers allow for marking

of a selected group of different age objects (different generation) to be able to be used together

and reduce overhead associated with a generation scan.

As to claims 5, 13 and 21, Edit as modified discloses wherein the write barrier

elimination routine eliminates a write barrier by replacing a write barrier machine code

instruction with a no operation machine code instruction (See Endicott et al. column 12, lines 1-

14, also see column 10, lines 11-20, and column 10, lines 48-59).

Conclusion

7.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Neveen Abel-Jalil whose telephone number is 703-305-8114.

The examiner can normally be reached on 8:00AM-4: 30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Dov Popovici can be reached on 703-305-3830. The fax phone numbers for the

organization where this application or proceeding is assigned are 703-746-7239 for regular

communications and 703-746-7240 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is 703-305-3900.

Neveen Abel-Jalil
March 11, 2003

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